ERDC/CERL TR-04-19

Construction Engineering Research Laboratory

US Army Corps of Engineers®
Engineer Research and Development Center

# SPiRiT Scoring Through Self-Assessment Charrettes

Richard Schneider and Donald F. Fournier

September 2004

ERDC/CERL TR-04-19
September 2004

# SPiRiT Scoring Through Self-Assessment Charrettes

Richard Schneider

*Construction Engineering Research Laboratory*
*PO Box 9005*
*Champaign, IL 61826-9005*

Donald F. Fournier

*Building Research Council*
*University of Illinois, Urbana-Champaign*

Final Report



Prepared for U.S. Army Corps of Engineers
Washington, DC 20314-1000

Under Work Unit # X211, Task 23

**ABSTRACT:** The Sustainable Project Rating Tool (SPiRiT) was developed by the U.S. Army Engineer Research and Development Center (ERDC) as a measurement system for rating new and major renovations to institutional buildings. SPiRiT evaluates environmental performance from a whole building perspective over a building's life cycle and provides a definitive standard to assess the sustain-ability or "green" attributes of the design-construct process for a given project. SPiRiT addresses critical areas of the design-construct process for seven categories or issues: site, water, energy usage, materials, indoor environmental quality, facility delivery, and current mission. The rating system consists of prerequisites and credits that when met provide points towards an overall score. The overall score is use to indicate one of four project certification levels—Bronze, Silver, Gold, and Platinum, indicating increasing levels of sustainability or "greenness." All Army Military Construction projects and major OMA projects must achieve a Bronze rating level. This work was undertaken to provide an informational guide for installation Directorate of Public Works (DPW) and U.S. Army Corps of Engineer District Engineer staffs in conducting self-assessment charrettes to score projects designed to meet SPiRiT requirements.

# Contents

# Preface

This study was conducted for The Directorate of Military Programs, U.S. Army Corps of Engineers, and the Directorate of Facilities and Housing, U.S. Army Assistant Chief of Staff for Installation Management (HQACSIM) under project number 40162784AT45, "Energy Technologies Applied to Military Facilities"; Work Unit X211, "Guidance for Sustainable Building Delivery"; Task 23, "Self Assessment Charrette and Rating Checklist." The technical monitors were Harry Goradia, CEMP-SPD and John Scharl, DAIM-FDF-FE.

The work was performed by the Facilities Maintenance Branch (CF-F), of the Facilities Division (CF), Construction Engineering Research Laboratory (CERL). The CERL Principal Investigator was Richard L. Schneider. Part of this work was performed under IDC Contract No. DACA88-99-D-0002, by Donald F. Fournier, who is associated with the Building Research Council, at the University of Illinois, Urbana-Champaign. Mark Slaughter is Chief, CECER-CF-F, and L. Michael Golish is Operations Chief, CECER-CF. The Director of CERL is Dr. Alan W. Moore

CERL is an element of the U.S. Army Engineer Research and Development Center (ERDC), U.S. Army Corps of Engineers. The Commander and Executive Director of ERDC is COL James R. Rowan, and the Director of ERDC is Dr. James R. Houston.

# 1 Introduction

## Background

The Sustainable Project Rating Tool (SPiRiT) was developed by the U.S. Army Engineer Research and Development Center (Schneider, Flanders et al. 2001) and is a measurement system for rating new and major renovations to institutional buildings. It evaluates environmental performance from a whole building perspective over a building's life cycle and provides a definitive standard to assess the sustainability or "green" attributes of the design-construct process for a given project. SPiRiT was developed under a licensing agreement with the U.S. Green Building Council to adapt the Leadership in Energy and Environmental Design (LEED™) green building rating system to the military built environment (USGBC 2000). SPiRiT addresses critical areas of the design-construct process for seven categories or issues: site, water, energy usage, materials, indoor environmental quality, facility delivery, and current mission. The rating system consists of prerequisites and credits that when met provide points towards an overall score. Each credit has a defined intent and one or more requirements that must be met to garner the points. The overall score is use to indicate one of four project certification levels—Bronze, Silver, Gold, and Platinum. The order indicates increasing levels of sustainability or greenness. All Army Military Construction projects and major OMA projects must achieve a Bronze rating level. Projects selected as showcase projects need to achieve a Gold or Platinum certification level. Installations may select higher minimum rating levels for OMA projects.

## Objective

The objective of this work was to provide an informational guide for installation DPW and COE District Engineer staffs in the conduct of self-assessment charrettes to score projects designed to meet the SPiRiT requirements.

## Approach

The approach to this SPiRiT scoring process guide was to conduct a review of the design process and determine the crucial points when scoring should be undertaken

and to provide guidance on how to conduct this scoring. The major assumption is that this will be a self-assessment process by the building project team and the user. Third party involvement is to be kept to a minimum, although help with credit interpretations and arbitration of scoring disputes should also be available from a central source within the Army.

The approach recommends three periods during the design/construct process where SPiRiT scoring needs to be considered and addressed. These are during the initial design charrette, after the design is complete, and after construction is complete. Each period will be addressed separately.

## Mode of Technology Transfer

This report will be made accessible through the World Wide Web (WWW) at URL:

http://www.cecer.army.mil

# 2 Sustainable Design and Project Management

## Integrated Design

The traditional design process, a linear progression from design to construction to occupancy, is driven by cost, schedule, and the desired quality. Sustainable design requires decisions that reflect the interconnections between environmental stewardship, cultural stewardship, and life cycle cost implications within the built environment. This requires an integrative process that brings all interested parties together for synergistic knowledge enhancement and effective decisions.

Sustainable design requires a comprehensive and inclusive process to facilitate resource efficiency, pollution avoidance, healthy and productive workspace, and lower costs. The traditional design process, linear, compartmentalized, and focused on upstream decision-making, severely impacts downstream building performance. The current design payment paradigm provides little incentive to work creatively to reduce total project costs over the life cycle or to promote high design standards. Rewards are few for those who create resource efficient, attractive, and productive working and living environments. Recent experience indicates that the economic return on more productive work environments will quickly repay any extra investment required in the design and construction process (Heerwagon 2002). Engineering and Construction Bulletin Number 2002-13 provide guidance on conducting the Design Charrette (Young 2002). The purpose of design charrette is to ensure that an integrated design takes place. The sustainable design process starts with a charrette.

Successful sustainable designs must include the following steps:

1. Team building and goal setting
2. Design optimization
3. Construction documents and specifications
4. Construction
5. Commissioning
6. Operations and Maintenance.

Much of the information in this chapter is adapted from the State of Pennsylvania's Guidelines for Creating High-Performance Green Buildings (Kobet, Lee et al. 1999).

## Team building and goal setting

The greatest opportunities for project success lie in the initial stage of the process – team building and goal setting. Project changes are usually more costly and less desirable to make in the latter stages of design and construction. Therefore, sound sustainable design and development practices must be established at the "front end," the conceptual stage where process intervention is easy, well before final designs. The time required for planning and thinking must be acknowledged and allowed. All project stakeholders must be encouraged to proffer and evaluate design aspects in an atmosphere conducive to exploration and creative solutions during the design charrette. The goal of reducing project costs while increasing energy and resource efficiency must be viewed as viable and success can be measured by the degree to which the interests of the occupants and the natural environment have been addressed. Properly done, an equitable balance between these latter two interests will be reflected in a project that is functionally superior, aesthetically pleasing, environmentally and culturally sensitive, and economically sound.

The most important and fundamental steps in sustainable design are the establishment of the "green" team and defining project goals and must not to be overlooked or compromised in the pressures to meet budget and schedule. Habits of the past will get the same results as in the past, so if you want a result that is different and better, then the process must be different and better. All team members must be educated, oriented, and focused on the goals, costs, and benefits of sustainable design and development. A lack of specific in-house talent can be addressed using outside consultants. The team must work cooperatively and collaboratively to define requirements and identify synergistic opportunities. Knowledge within the various required disciplines and building systems must be shared, facilitating higher levels of required integration.

The team should include all stakeholders, representatives of all parties affected by the building. The conventional design team—the DPW, the District Engineer project staff, the architect, engineers, consultants, and contractors—working through a linear design process must now shift to a multidisciplinary, cooperative, and collaborative "total systems" approach. All team members must be actively engaged in the project definition and goal setting; early in the process, setting the stage for later project cooperation, collaboration, and effective design integration. A sustainable design team should also be broadened to include the DPW, the user, O&M staff, architects, engineers, consultants, the construction manager (District), the contractor, subcontractors and suppliers, historic preservation staff (if applicable),

occupational health and safety staff, and any other party with the affected community who could contribute to the process.

The team should set goals early in the process; developing a vision statement and goals to reflect the vision, defining design criteria, and prioritizing the design criteria. The vision statement should define the overall broad objective such as, "Adaptively reuse Building 542 while minimizing environmental impact and preserving our cultural heritage" or "construct a soldier community that minimizes environmental impact and provides high performance living and working space." The second step, goals that reflect the vision, should address issues such as "Save energy by incorporating daylighting and passive tempering." Such a goal can be further developed into a defined, achievable design criteria such as, "The ambient light level will be lowered to 30 foot candles, and we will use transoms, clerestories, and T-8 fluorescent lamps with auto dimming and the windows will be restored to their original height and high visible transmittance glazing used." The design criteria can then be prioritized. If, for example, natural lighting is more important than high efficiency fixtures or dimming controls, such prioritization will allow choices if budget constraints require them.

These design criteria directly reflect credits in SPiRiT. SPiRiT may be used as a guide during this process to ensure sustainable aspects are addressed and to determined the expected SPiRiT certification level for the project—Bronze, Silver, Gold, or Platinum. The expected credits that will be attained and the certification level desired then become part of the overall goals and vision for the project. It is these expected credits that must be scored later in the project cycle during the two scoring charrettes. **Appendix A** contains the project Design Charrette SPiRiT Summary sheet to be used in documenting the expected credits and design goals for SPiRiT certification level. Documentation of these activities should be incorporated in a project SPiRiT Scoring Notebook. Other documents will be added later in the scoring process.

The following checklist of activities fall into the predesign stage of the design process.

- ❑ Assemble sustainable design team.
- ❑ Develop project vision.
- ❑ Establish project goals.
- ❑ Establish project design criteria to meet goals.
- ❑ Set priorities between the criteria and goals.
- ❑ Establish desired SPiRiT Certification Level.
- ❑ Establish SPiRiT credits to be incorporated to achieve the certification level.
- ❑ Set up the project SPiRiT Scoring Notebook.
- ❑ Develop a performance based building program.

- ❑ Establish the design energy budget (DEB) and break into sub-goals for conditioning energy and lighting energy budgets.
- ❑ Develop partnering strategies within the team.
- ❑ Develop the project schedule.
- ❑ Review codes and standards both for standard design issues and historical preservation issues.
- ❑ Conduct any required research.
- ❑ Establish new current working estimate (CWE).

## Design Optimization

Design optimization, the process of refining and maximizing the performance and cost effectiveness of all aspects of the project, addresses not only the schedule and budget but also the total building performance. Evaluating and balancing the impacts of each system against another, long-term stewardship, and building operation, all fall within the context of integrated design, along with optimizing the building systems and their interrelationships.

After setting goals, criteria, and priorities in the predesign stage, the team must optimize all aspects of the project through a design process that consistently evaluates all systems and products to ensure that target goals are being met or exceeded. This process enables the myriad of choices to be handled in an orderly fashion while maintaining consistent goals and objectives. Matrices of green criteria such as performance levels, SPiRiT credits, or other information can facilitate evaluations among systems or products.

Computer modeling of buildings is an important tool for evaluating and integrating choices of system and envelope modifications to achieve optimum building performance. For major renovations, modeling of historic and existing buildings can represent special challenges; “as built” drawings may not be available and incremental past changes may have altered original building designs and performance (Geva 1998). Both the current and original conditions should be modeled, establishing best starting point for choosing building modifications and upgrades to improve energy efficiency. Design choices such as minimal energy consumption and maximum daylighting cannot be correctly made without understanding of system-integrated impacts such as the glazing, thermal envelope, mechanicals, thermal massing, and others. The results of computer modeling can provide factual information on which to base the choices of the design team. Though computer projections are often imprecise or inaccurate in predicting actual building performance, they can provide valid comparative information from which the relative performance of different systems and materials can be ascertained.

Other design aspects should be optimized in concert with building systems, including functional issues such as the space utilization, shared services, flexibility, and adaptability to future missions and functions. Building systems optimization also requires the coordination of structural changes and component construction strategies. Adaptations to alternate future use and function, and ultimate building disposition, should be considered early in the process; incorporating issues of recyclability and the future deconstruction and reuse of salvaged building components. Materials should also be efficiently used, minimizing waste in construction and the use of unique components and systems. During this process, the management of lead-based paint may need to be addressed though it should not pose an overriding issue in the planning process, just an additional factor in major renovations or adaptive reuse designs and plans.

Design optimization process varies with project types and goals and is crucial for successful and sustainable design, balancing the issues of green design, high performance, and effective work and living space. The project team must be committed to a continuous process of design improvement and optimization. Every design meeting must be a sustainable design meeting. Losing sight of the goals and sustainable design elements is the surest way to ensure that they do not get incorporated.

The following checklist of activities constitutes the design optimization stage of the design process.

- ❑ Develop sustainable solutions.
- ❑ Evaluate these solutions.
- ❑ Check costs and performance of the solutions.
- ❑ Integrate systems and optimize solutions.
- ❑ Refine the solutions
- ❑ Recheck cost and viability.
- ❑ Document sustainable solutions.
- ❑ Track SPiRiT credits and complete suggested documentation as the design progresses.

## Construction Documents and Specifications

Typical design documentation includes the construction drawings, specifications, and any change orders that materialize during construction and commissioning. Construction documents, representing the methods used to achieve the design intent, are included in the standard design drawings and specifications, but integrated systems drawings and supporting documents should also be developed as part of any sustainable design. Such supporting documents add clarity and efficiency to the design and documentation.

Specifications work hand in hand with the construction drawings to provide information that cannot be effectively illustrated, or that requires special procedural or component emphasis. Many important aspects of sustainable building such as construction waste management and commissioning must be included in specifications as well as any methods to address lead paint and other hazardous materials if the project is a renovation.

The following checklist of activities addresses the development of the construction drawings and specifications.

- ❑ Use the design documentation process to establish a clear statement of design intent.
- ❑ Include construction waste management, commissioning, lead-based paint and hazardous material amelioration, and O&M information in the specifications.
- ❑ Develop building system integration drawings to illustrate how the various systems and components relate to each other.
- ❑ Use the construction documents as a basis for a comprehensive set of operating instructions.

## Construction

Construction is a crucial part of sustainable design and development and the game can easily be lost at this stage. The desires and concepts developed through planning and design must be implemented during the construction stage. Any applied "value engineering" must reflect true life cycle costs and not first costs (FFC 2001). Any design alterations or changes made must consider their impact on the building "as a whole" and how performance will be altered after the change is made. Holistic designs can be readily sabotaged at this stage, and often are. For example, spectrally selective glazing can be replaced by simple double pane glass changing the solar heat gain coefficients for the windows, along with the shading coefficients and visible transmittance. This will alter building loads and render the heating and cooling systems too small, the daylighting system invalid, and produce unacceptable glare within the workspaces, all resulting in poorly conditioned, low quality workspace that uses more energy over its entire life – all for a minor first cost savings in glazing.

All changes should be submitted and reviewed to ensure compliance with the high performance standards set in the design. Any material substitution must be thoroughly "vetted" ensuring that the design intent is not subverted and hazards are not introduced that might compromise indoor air quality and health.

The design team must coordinate with the construction team and the general contractor must be responsible for implementing the "green" elements of the design in

the construction process and be accountable for them. Sustainability goals must be articulated to the construction staff and the contractor made responsible for recycling construction waste, recovering recyclable building components during demolition, and protecting new building materials from moisture and weather damage and exposure.

Accurate "as built" drawings and other records must be maintained to assist in the commissioning and ongoing operation and maintenance of the completed project (see sections below).

## Commissioning

As buildings have become more complex and incorporate new functions, new operational problems have surfaced—such as excessive energy costs, malfunctioning mechanical equipment, and uncomfortable working conditions. Building system problems can often be identified, documented, and corrected through the process called "commissioning," which can positively impact energy bills and occupant comfort (Manke, Hittle et al. 1996). Commissioning is a systematic process of verifying and documenting building systems or subsystems performance against the building design criteria and the owner's operational needs. Ideally, the process begins during the design phase and lasts 1 year or more after the construction is complete. The commissioning process should include training of the building's operations and maintenance staff. ASHRAE Guideline 1-1996, The HVAC Commissioning Process, defines commissioning as the process of ensuring that systems are designed, installed, functionally tested, and capable of being operated and maintained to perform in conformity with the design intent (ASHRAE 1996). Commissioning begins with planning and includes design, construction, start-up, acceptance, and training, and can be applied throughout the life of the building. Since commissioning maximizes energy efficiency, it has the benefit of minimizing environmental impacts associated with the building's energy consumption.

Specific commissioning recommendations are:

- Engage a commissioning agent to oversee the commissioning process.
- Include commissioning requirements in the construction documents.
- Develop a commissioning plan.
- Verify the installation and proper performance of all building systems.
- Ensure that accurate as-built drawings and contract document revisions are maintained and distributed to all members of the commissioning team.
- Develop documentation and a training program for the building operators and occupants.
- Retain the commissioning documents as part of the permanent building records.

The systems that should be commissioned are:

- Mechanical: boilers, all pumps, air handing equipment, chillers, cooling tower, and all HVAC controls and building automation systems.
- Plumbing: domestic hot water heaters, pumps, tanks, compressors, and controls.
- Electrical: Standby power, security systems, fire management systems, and controls.
- Other: Sprinklers, elevators, audio/visual systems, and controls.

Commissioning can encompass more that just the energized systems. Green commission also ensures follow-through on non-energized aspects of the building that impact environmental performance. These are such items as ensuring the correct glazing is purchased and installed on the proper façade of the building, double checking the materials for conformance to VOC limits, their recycled content, and other pertinent materials issues. Information on commissioning is readily available on the Internet. Technical documents may be found at the following sites:

- U.S. Army Corps of Engineers Huntsville Engineering and Support Center, TECHINFO Internet: http://www.hnd.usace.army.mil/techinfo/index.htm
- Construction Criteria Base, National Institute of Building Sciences, 1090 Vermont Avenue N.W., Suite 700, Washington DC 20005-4905, (877) 222-5667, (202) 289-7800, FAX (202) 289-1092, Email: ccb@nibs.org CCB Online: http://www.ccb.org
- Engineer Research and Development Center, Construction Engineering Research Laboratory(ERDC-CERL), http://www.cecer.army.mil

## Operations and maintenance

Proper operation and maintenance of a green building is essential to ensure that both the longevity of the structure and systems, and continued benefits, such as energy efficiency and productive work environments, are built into the project. Once commissioning is complete, the operations and maintenance staff must ensure that the equipment and systems perform as designed over the building life. Seemingly minor issues, such as the choice of cleaning materials, can have a significant negative impact on the indoor environment.

Both the O&M staff and occupants must be educated about building functions, operating procedures, and maintenance schedules. Proper design recognizes future needs and incorporates maintenance issues.

A well-designed cleaning regimen avoids the use of harsh cleaning chemicals while facilitating good hygiene and indoor air quality. Good indoor air quality will also require cleaning and maintenance of ductwork and space conditioning equipment,

essential for avoiding mold or other pathogens. Pans and drains in HVAC systems must be kept clean and clog-free.

Building controls require regular tuning and calibration for continued proper function and maintenance of space conditioning. A process of "continuous commissioning," where systems are continuously monitored to ensure proper operation and efficiency, can be done with a building automation system or through add-on software applications to the digital control systems.

Specific O&M recommendations are:

- Include O&M issues in the initial design criteria.
- Adhere to manufacturers recommendations for proper O&M of building systems and equipment including warranty requirements.
- Educate building occupants and maintenance staff to the green aspects of the design and how they can ensure the continued benefits of high performance workspace.
- Use an environmentally responsible cleaning regimen that ensures good indoor air quality and occupant health.
- Maintain it as a whole, like it was designed, not as separate components.

Achieving a sustainable design and then actual getting it constructed is a complex undertaking that requires conscientious follow-through and attention to detail. These efforts will pay off in a project that is not only better living and work space, but in one that will reap benefits in several areas such a worker productivity, reduced energy costs, reduced sick leave and absenteeism, and higher employee morale.

# 3 Initial Project Scoring Charrette

The Initial Project Scoring Charrette is the first official tabulation on how the design process is meeting the SPiRiT goals set forth in the design charrette. In the design charrette process, the team developed goals and an expected level of SPiRiT certification for the project. This level of certification was based on meeting all of the prerequisites in SPiRiT and a certain number of the credits to account for a final score within the certification bracket level. Attaining of these credits should be informally tracked during the design process to ensure progress. Once the design is complete, a formal initial scoring charrette should take place.

This initial scoring charrette is required to ensure that there has been follow-through on the sustainable aspects of the design and that they have been incorporated into the design drawings and specifications. The initial scoring charrette is the first of two recommended scoring charrettes. The final scoring charrette should take place once the project has been commissioned. The charrette should be hosted by the installation where the project will be constructed. Most of the key players from the project delivery team, the installation, and the MACOM should attend. With proper preparation and documentation of the credits, this should be a 1-day meeting.

The result of this charrette should be a go/no go decision to proceed with construction. If the sustainable aspects of the design have not been incorporated at this point, they surely will not be incorporated during the construction process. The decisions on how to alter the design and incorporate the missed sustainable aspects must be made. Impacts on the schedule and budget may result from the design failing to achieve its sustainable rating at this point. That is why it is imperative to informally follow credit attainment during the design process. As noted previously, every design meeting should also be a sustainability meeting.

The scoring charrette should be approached in the same collaborative manner as the design charrette. A positive approach will achieve better results than an adversarial approach. Therefore, scoring of the project is intended to be an inclusive process where all parties reach consensus on whether the credit has been achieved. There may be some disagreement and an inability to achieve consensus. In this case, it is recommended that the credit attainment and interpretation procedures later in this guide be followed.

Start the charrette with a review of the initial goals from the design charrette found in the SPiRiT Scoring Notebook. This should be followed by a short discussion of each prerequisite and credit and whether or not it was attained. All prerequisites must be met for the project to receive a SPiRiT Certification Level.

The scoring should be tabulated on the Initial Project SPiRiT Scoring Summary sheet found in **Appendix B**. The total score indicates how well the design met the goals. Based on this score, the SPiRiT Design Certification Level is set. Place the score sheets in the project SPiRiT Scoring Notebook along with any documentation of the prerequisites and credits. An additional recommended task is compiling a charrette summary with lessons learned. A copy of the binder should be kept with the project files. This binder will be used in the Final Project Scoring Charrette.

Note that this will be a learning process for most participants; there will be some initial kinks in the process. Sustainable design is a relatively new process and everyone is on a fairly steep learning curve. Positive attitudes and a team spirit will certainly help the team to achieve its goals.

# 4 Final Project Scoring Charrette

The Final Project Scoring Charrette takes place once the building has been commissioned and the user has obtained beneficial occupancy. The purpose of the final scoring charrette is to ensure that the final product was as expected and the sustainable aspects of the design were all achieved. There is significant opportunity for things to change between design and completion of construction – material substitutions, change orders, and misinterpretation of specifications. The final scoring allows a comprehensive look at the project and offers an opportunity to review the significant achievements of the sustainable design process.

The Final Project Scoring Charrette should be conducted at the installation and, preferably, at the project site. The same principals should be present as during the initial scoring charrette. This may depend on the type of design/construct paradigm used and some flexibility on who is involved is appropriate. It is hoped that a design firm, even if not involved in construction would have enough enlightened self-interest to attend and see how their design was realized. Important lessons for the design team will come out at this stage. Most of the key players from the project delivery team, the installation, and MACOM should attend. Proper preparation and documentation of the credits should enable this to be a 1-day meeting.

The result of this scoring charrette will be the final project rating. Good results will depend on how well the sustainable aspects of the project design were carried out. That is why it is imperative to informally follow credit attainment during the construction process. Every construction meeting should also be a sustainability meeting. It is imperative to keep sustainability in the minds of all involved, if it is not, results will not be achieved. A green building does not happen on its own, even with the best design.

The scoring charrette should be approached in the same collaborative manner as the design and initial scoring charrettes. A positive approach will achieve better results than an adversarial approach. Therefore, scoring of the project is intended to be an inclusive process where all parties reach consensus on whether the credit has been achieved. There may be some disagreement and an inability to achieve consensus. In this case, it is recommended that the credit attainment and interpretation procedures later in this guide be followed.

Start the charrette with a review of the results of the Initial Project Scoring Charrette. The construction process is formed by the design, so credits attained will be only those incorporated in the design. This should be followed by a short discussion of each prerequisite and credit and whether or not it was attained. All prerequisites must be met for the project to receive a SPiRiT Certification Level.

The scoring should be tabulated on the Final Project SPiRiT Scoring Summary sheet found in **Appendix C**. The total score indicates how well the project met the goals. Based on this score, the Final SPiRiT Certification Level is set. Place the score sheets in the SPiRiT Scoring Notebook along with any documentation of the prerequisites and credits. An additional recommended task is compiling a charrette summary with lessons learned. Send a copy of the Final Project SPiRiT Scoring Summary sheet to the Engineer Research and Development Center, attention: Richard Schneider. POC information is found in the SPiRiT Rating System.

Again, note that this will be a learning process for most participants; there will be some initial kinks in the process. Sustainable design is a relatively new process and everyone is on a fairly steep learning curve. Positive attitudes and a team spirit will certainly help the team to achieve its goals.

# 5 Credit Issues

## Credit Attainment

Suggested documentation for the SPiRiT credits is provided in **Appendix D**. Verification of credit attainment will be based on a review and presentation of the suggested documentation or a similar acceptable statement or presentation of credit attainment. Evidence of credit attainment should be unambiguous and easily understood.

**No partial credit is to be given—a credit is either met or not.** As such, credits are whole integers. When two or more requirements are present to attain a point, all must be met. There may be a temptation to be lax on the credits, and this should be watched for and avoided. Being lax on credits will result in "greenwashing" of the project. Greenwashing is not in the best interests of the District, the installation, or the Army. The project will not really be as sustainable as indicated and probably not achieve the benefits of sustainable design. It defeats the purpose of a rating system and makes the goals hollow.

## Credit Interpretations

In some cases, the design team may encounter difficulties in applying prerequisites and credits to a project. There will also be legitimate divergence of views on whether or not a credit has been met. The design team should be prepared for this contingency. One source for credit interpretations available is the U.S. Green Buildings Council's (USGBC) credit interpretation records. The credits in LEED™ are continually being interpreted and SPiRiT is expected to experience the same questions. The USGBC credit interpretations requests (CIR) page is available on the web at http://www.usgbc.org. CIRs are listed by credit category and updated monthly. Access is to members only. The Army is a member. Another resource for credit information is the LEED™ Reference Guide (Paladino 2001). It provides extensive guidance on meeting credits, how to perform any calculations, and how to document them. The documentation requirements of LEED™ are compatible with those of SPiRiT. It is recommended that each project team and installation obtain a copy of the Reference Guide from the USGBC.

In the case that the above references cannot guide the self-assessment charrette to an agreed upon solution, the Engineer Research and Development Center is available to provide assistance. Contacts for credit interpretation are: Richard Schneider at Richard.L.Schneider@erdc.usace.army.mil and Annette Stumpf at Annette.L.Stumpf@erdc.usace.army.mil. Credit interpretations should be submitted by email with contracts provided. The recommended procedure for reviewing credit questions is outlined below:

- Consult the LEED Reference Guide and SPiRiT for a detailed description of the credit intent and requirements.
- Review the intent of the credit or prerequisite in question to self-evaluate whether their project meets this intent.
- Review the LEED Credit Interpretations Rulings (CIR) page for previously logged CIRs on relevant credits.
- If a similar credit interpretation has not been logged, submit a credit interpretation request to ERDC. The inquiry should be succinct and based on information found in the Reference Guide, with emphasis on the intent of the prerequisite or credit. Relevant project details may be described to support the project team's interpretation of the credit or prerequisite.

# Conclusion

This work has provided an informational guide to help installation DPW and COE District Engineer staffs conduct self-assessment charrettes to score projects designed to meet SPiRiT requirements.

Successful sustainable designs must include:

1. Team building and goal setting
2. Design optimization
3. Construction documents and specifications
4. Construction
5. Commissioning
6. Operations and Maintenance.

# Bibliography

American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE), *The HVAC Commissioning Process* (ASHRAE, Atlanta, GA, 1996).

Federal Facilities Council (FFC), *Sustainable Federal Facilities: A Guide to Integrating Value Engineering, Life-Cycle Costing, and Sustainable Development* (National Academy Press, Washington, DC, 2001), p 136.

Geva, A., "Energy Simulation of Historic Buildings: St. Louis Catholic Church Castroville, Texas," *The Journal of Preservation Technology* (1998), vol XXIX, No. 1, pp 36-41.

Heerwagon, J., "Sustainable Design Can Be an Asset to the Bottom Line," *Environmental Design + Construction* (July-August 2002).

Kobet, B., S. Lee, et al., *High Performance Green Buildings* (Pennsylvania Department of Environmental Protection, 1999).

Manke, J., D.C. Hittle, et al., *An Improved Building Energy Performance Commissioning Process Based on Short-Term Testing* (Construction Engineering Research Laboratory [CERL], Champaign, IL, 1996).

Paladino, *LEED Green Building Reference Guide* (U.S. Green Building Council [USGBC], Washington DC, 2001).

Schneider, R., S. Flanders, et al., *Sustainable Project Rating Tool* (CERL, 2001).

USGBC, *Leadership in Energy and Environmental Design (LEED)* (2000).

Young, A., *Design Charrette Guidance for Military Construction Programs* (U.S. Army Corps of Engineers, Washington, DC, 2002), p 6.

# Appendix A: Design Charrette SPiRiT Summary

| | Design Charrette SPiRiT Summary | | |
|---|---|---|---|
| **1.0** | **Sustainable Sites (S)** | **0** | **Max 20** |
| 1.R1 | Erosion, Sedimentation and Water Quality Control | | [Required] |
| 1.C1 | Site Selection | | 2 |
| 1.C2 | Installation/Base Redevelopment | | 2 |
| 1.C3 | Brownfield Redevelopment | | 1 |
| 1.C4 | Alternative Transportation | | 4 |
| 1.C5 | Reduced Site Disturbance | | 2 |
| 1.C6 | Stormwater Management | | 2 |
| 1.C7 | Landscape and Exterior Design to Reduce Heat Islands | | 2 |
| 1.C8 | Light Pollution Reduction | | 1 |
| 1.C9 | Optimize Site Features | | 1 |
| 1.C10 | Facility Impact | | 2 |
| 1.C11 | Site Ecology | | 1 |
| **2.0** | **Water Efficiency (W)** | **0** | **Max 5** |
| 2.C1 | Water Efficient Landscaping | | 2 |
| 2.C2 | Innovative Wastewater Technologies | | 1 |
| 2.C3 | Water Use Reduction | | 2 |
| **3.0** | **Energy and Atmosphere (E)** | **0** | **Max 28** |
| 3.R1 | Fundamental Building Systems Commissioning | | [Required] |
| 3.R2 | Minimum Energy Performance | | [Required] |
| 3.R3 | CFC Reduction in HVAC&R Equipment | | [Required] |
| 3.C1 | Optimize Energy Performance | | 20 |
| 3.C2 | Renewable Energy | | 4 |
| 3.C3 | Additional Commissioning | | 1 |
| 3.C4 | <<Deleted>> | | |
| 3.C5 | Measurement and Verification | | 1 |
| 3.C6 | Green Power | | 1 |
| 3.C7 | Distributed Generation | | 1 |
| **4.0** | **Materials and Resources (M)** | **0** | **Max 13** |
| 4.R1 | Storage & Collection of Recyclables | | [Required] |
| 4.C1 | Building Reuse | | 3 |
| 4.C2 | Construction Waste Management | | 2 |
| 4.C3 | Resource Reuse | | 2 |
| 4.C4 | Recycled Content | | 2 |
| 4.C5 | Local/Regional Materials | | 2 |
| 4.C6 | Rapidly Renewable Materials | | 1 |
| 4.C7 | Certified Wood | | 1 |

| Design Charrette SPiRiT Summary (Continued) | | | Maximum Points |
|---|---|---|---|
| **5.0** | **Indoor Environmental Quality (IEQ) [Q]** | **0** | **Max 17** |
| 5.R1 | Minimum IAQ Performance | | [Required] |
| 5.R2 | Environmental Tobacco Smoke (ETS) Control | | [Required] |
| 5.C1 | IAQ Monitoring | | 1 |
| 5.C2 | Increase Ventilation Effectiveness | | 1 |
| 5.C3 | Construction IAQ Management Plan | | 2 |
| 5.C4 | Low-Emitting Materials | | 4 |
| **5.0** | **Indoor Environmental Quality (IEQ) [Q] (Continued)** | **0** | **Max 17** |
| 5.C5 | Indoor Chemical and Pollutant Source Control | | 1 |
| 5.C6 | Controllability of Systems | | 2 |
| 5.C7 | Thermal Comfort | | 2 |
| 5.C8 | Daylight and Views | | 2 |
| 5.C9 | Acoustic Environment /Noise Control | | 1 |
| 5.C10 | Facility In-Use IAQ Management Plan | | 1 |
| **6.0** | **Facility Delivery Process (P)** | **0** | **Max 7** |
| 6.C1 | Holistic Delivery of Facility | | 7 |
| **7.0** | **Current Mission** | **0** | **Max 6** |
| 7.C1 | Operation and Maintenance | | 3 |
| 7.C2 | Soldier and Workforce Productivity and Retention | | 3 |
| **8.0** | **Future Missions** | **0** | **Max 4** |
| 8.C1 | Functional Life of Facility and Supporting Systems | | 2 |
| 8.C2 | Adaptation, Renewal and Future Uses | | 2 |
| | **Total** | **0** | **Max 100** |

| SPiRiT Target Certification Levels | | |
|---|---|---|
| **SPiRiT Bronze** | | **25 to 34 Points** |
| **SPiRiT Silver** | | **35 to 49 Points** |
| **SPiRiT Gold** | | **50 to 74 Points** |
| **SPiRiT Platinum** | | **75 to 100 Points** |

## Project Points of Contact

# Appendix B Initial Project SPiRiT Scoring Summary

| | Initial Project SPiRiT Scoring Summary | | | |
|---|---|---|---|---|
| **1.0** | **Sustainable Sites (S)** | **Score** | **0** | **Max 20** |
| 1.R1 | Erosion, Sedimentation and Water Quality Control | | | [Required] |
| 1.C1 | Site Selection | | | 2 |
| 1.C2 | Installation/Base Redevelopment | | | 2 |
| 1.C3 | Brownfield Redevelopment | | | 1 |
| 1.C4 | Alternative Transportation | | | 4 |
| 1.C5 | Reduced Site Disturbance | | | 2 |
| 1.C6 | Stormwater Management | | | 2 |
| 1.C7 | Landscape and Exterior Design to Reduce Heat Islands | | | 2 |
| 1.C8 | Light Pollution Reduction | | | 1 |
| 1.C9 | Optimize Site Features | | | 1 |
| 1.C10 | Facility Impact | | | 2 |
| 1.C11 | Site Ecology | | | 1 |
| **2.0** | **Water Efficiency (W)** | **Score** | **0** | **Max 5** |
| 2.C1 | Water Efficient Landscaping | | | 2 |
| 2.C2 | Innovative Wastewater Technologies | | | 1 |
| 2.C3 | Water Use Reduction | | | 2 |
| **3.0** | **Energy and Atmosphere (E)** | **Score** | **0** | **Max 28** |
| 3.R1 | Fundamental Building Systems Commissioning | | | [Required] |
| 3.R2 | Minimum Energy Performance | | | [Required] |
| 3.R3 | CFC Reduction in HVAC&R Equipment | | | [Required] |
| 3.C1 | Optimize Energy Performance | | | 20 |
| 3.C2 | Renewable Energy | | | 4 |
| 3.C3 | Additional Commissioning | | | 1 |
| 3.C4 | <<Deleted>> | | | |
| 3.C5 | Measurement and Verification | | | 1 |
| 3.C6 | Green Power | | | 1 |
| 3.C7 | Distributed Generation | | | 1 |
| **4.0** | **Materials and Resources (M)** | **Score** | **0** | **Max 13** |
| 4.R1 | Storage & Collection of Recyclables | | | [Required] |
| 4.C1 | Building Reuse | | | 3 |
| 4.C2 | Construction Waste Management | | | 2 |
| 4.C3 | Resource Reuse | | | 2 |
| 4.C4 | Recycled Content | | | 2 |
| 4.C5 | Local/Regional Materials | | | 2 |
| 4.C6 | Rapidly Renewable Materials | | | 1 |
| 4.C7 | Certified Wood | | | 1 |

| Initial Project SPiRiT Scoring Summary (Continued) | | | | Maximum Points |
|---|---|---|---|---|
| **5.0** | **Indoor Environmental Quality (IEQ) [Q]** | **Score** | **0** | **Max 17** |
| 5.R1 | Minimum IAQ Performance | | | [Required] |
| 5.R2 | Environmental Tobacco Smoke (ETS) Control | | | [Required] |
| 5.C1 | IAQ Monitoring | | | 1 |
| 5.C2 | Increase Ventilation Effectiveness | | | 1 |
| 5.C3 | Construction IAQ Management Plan | | | 2 |
| 5.C4 | Low-Emitting Materials | | | 4 |
| **5.0** | **Indoor Environmental Quality (IEQ) [Q] (Continued)** | **Score** | **0** | **Max 17** |
| 5.C5 | Indoor Chemical and Pollutant Source Control | | | 1 |
| 5.C6 | Controllability of Systems | | | 2 |
| 5.C7 | Thermal Comfort | | | 2 |
| 5.C8 | Daylight and Views | | | 2 |
| 5.C9 | Acoustic Environment /Noise Control | | | 1 |
| 5.C10 | Facility In-Use IAQ Management Plan | | | 1 |
| **6.0** | **Facility Delivery Process (P)** | **Score** | **0** | **Max 7** |
| 6.C1 | Holistic Delivery of Facility | | | 7 |
| **7.0** | **Current Mission** | **Score** | **0** | **Max 6** |
| 7.C1 | Operation and Maintenance | | | 3 |
| 7.C2 | Soldier and Workforce Productivity and Retention | | | 3 |
| **8.0** | **Future Missions** | **Score** | **0** | **Max 4** |
| 8.C1 | Functional Life of Facility and Supporting Systems | | | 2 |
| 8.C2 | Adaptation, Renewal and Future Uses | | | 2 |
| | | **Score** | **0** | **Max 100** |

| SPiRiT Design Certification Levels | | |
|---|---|---|
| **SPiRiT Bronze** | | **25 to 34 Points** |
| **SPiRiT Silver** | | **35 to 49 Points** |
| **SPiRiT Gold** | | **50 to 74 Points** |
| **SPiRiT Platinum** | | **75 to 100 Points** |

## Project Points of Contact

# Appendix C: Final Project SPiRiT Scoring Summary

| Final Project SPiRiT Scoring Summary | | | | |
|---|---|---|---|---|
| **1.0** | **Sustainable Sites (S)** | | **0** | **Max 20** |
| 1.R1 | | Erosion, Sedimentation and Water Quality Control | | [Required] |
| 1.C1 | | Site Selection | | 2 |
| 1.C2 | | Installation/Base Redevelopment | | 2 |
| 1.C3 | | Brownfield Redevelopment | | 1 |
| 1.C4 | | Alternative Transportation | | 4 |
| 1.C5 | | Reduced Site Disturbance | | 2 |
| 1.C6 | | Stormwater Management | | 2 |
| 1.C7 | | Landscape and Exterior Design to Reduce Heat Islands | | 2 |
| 1.C8 | | Light Pollution Reduction | | 1 |
| 1.C9 | | Optimize Site Features | | 1 |
| 1.C10 | | Facility Impact | | 2 |
| 1.C11 | | Site Ecology | | 1 |
| **2.0** | **Water Efficiency (W)** | | **0** | **Max 5** |
| 2.C1 | | Water Efficient Landscaping | | 2 |
| 2.C2 | | Innovative Wastewater Technologies | | 1 |
| 2.C3 | | Water Use Reduction | | 2 |
| **3.0** | **Energy and Atmosphere (E)** | | **0** | **Max 28** |
| 3.R1 | | Fundamental Building Systems Commissioning | | [Required] |
| 3.R2 | | Minimum Energy Performance | | [Required] |
| 3.R3 | | CFC Reduction in HVAC&R Equipment | | [Required] |
| 3.C1 | | Optimize Energy Performance | | 20 |
| 3.C2 | | Renewable Energy | | 4 |
| 3.C3 | | Additional Commissioning | | 1 |
| 3.C4 | | <<Deleted>> | | |
| 3.C5 | | Measurement and Verification | | 1 |
| 3.C6 | | Green Power | | 1 |
| 3.C7 | | Distributed Generation | | 1 |
| **4.0** | **Materials and Resources (M)** | | **0** | **Max 13** |
| 4.R1 | | Storage & Collection of Recyclables | | [Required] |
| 4.C1 | | Building Reuse | | 3 |
| 4.C2 | | Construction Waste Management | | 2 |
| 4.C3 | | Resource Reuse | | 2 |
| 4.C4 | | Recycled Content | | 2 |
| 4.C5 | | Local/Regional Materials | | 2 |
| 4.C6 | | Rapidly Renewable Materials | | 1 |
| 4.C7 | | Certified Wood | | 1 |

| 5.0 | Indoor Environmental Quality (IEQ) [Q] | 0 | Max 17 |
|---|---|---|---|
| 5.R1 | Minimum IAQ Performance | | [Required] |
| 5.R2 | Environmental Tobacco Smoke (ETS) Control | | [Required] |
| 5.C1 | IAQ Monitoring | | 1 |
| 5.C2 | Increase Ventilation Effectiveness | | 1 |
| 5.C3 | Construction IAQ Management Plan | | 2 |
| 5.C4 | Low-Emitting Materials | | 4 |

## Final Project SPiRiT Scoring Summary (Continued)

| | | | Maximum Points |
|---|---|---|---|
| 5.0 | Indoor Environmental Quality (IEQ) [Q] (Continued) Score | 0 | Max 17 |
| 5.C5 | Indoor Chemical and Pollutant Source Control | | 1 |
| 5.C6 | Controllability of Systems | | 2 |
| 5.C7 | Thermal Comfort | | 2 |
| 5.C8 | Daylight and Views | | 2 |
| 5.C9 | Acoustic Environment /Noise Control | | 1 |
| 5.C10 | Facility In-Use IAQ Management Plan | | 1 |
| 6.0 | Facility Delivery Process (P) Score | 0 | Max 7 |
| 6.C1 | Holistic Delivery of Facility | | 7 |
| 7.0 | Current Mission Score | 0 | Max 6 |
| 7.C1 | Operation and Maintenance | | 3 |
| 7.C2 | Soldier and Workforce Productivity and Retention | | 3 |
| 8.0 | Future Missions Score | 0 | Max 4 |
| 8.C1 | Functional Life of Facility and Supporting Systems | | 2 |
| 8.C2 | Adaptation, Renewal and Future Uses | | 2 |
| | Tota | 0 | Max 100 |

## SPiRiT Final Certification Levels

| | | |
|---|---|---|
| SPiRiT Bronze | | 25 to 34 Points |
| SPiRiT Silver | | 35 to 49 Points |
| SPiRiT Gold | | 50 to 74 Points |
| SPiRiT Platinum | | 75 to 100 Points |

## Project Points of Contact

# Appendix D : SPiRiT Version 1.4.1 Documentation Guide

## SPiRiT Recommended Documentation by Credit

**1.0 Sustainable Sites**

1.R1 Erosion, Sedimentation and Water Quality Control
1.C1 Site Selection
1.C2 Installation/Base Redevelopment
1.C3 Brownfield Redevelopment
1.C4 Alternative Transportation
1.C5 Reduced Site Disturbance
1.C6 Stormwater Management
1.C7 Landscape and Exterior Design to Reduce Heat Islands
1.C8 Light Pollution Reduction
1.C9 Optimize Site Features
1.C10 Facility Impact
1.C11 Site Ecology

**2.0 Water Efficiency**

2.C1 Water Efficient Landscaping
2.C2 Innovative Wastewater Technologies
2.C3 Water Use Reduction

**3.0 Energy and Atmosphere**

3.R1 Fundamental Building Systems Commissioning
3.R2 Minimum Energy Performance
3.R3 CFC Reduction in HVAC&R Equipment
3.C1 Optimize Energy Performance
3.C2 Renewable Energy
3.C3 Additional Commissioning
3.C4 <<Deleted>>
3.C5 Measurement and Verification
3.C6 Green Power
3.C7 Distributed Generation

**4.0 Materials and Resources**

4.R1 Storage & Collection of Recyclables
4.C1 Building Reuse
4.C2 Construction Waste Management
4.C3 Resource Reuse
4.C4 Recycled Content
4.C5 Local/Regional Materials
4.C6 Rapidly Renewable Materials
4.C7 Certified Wood

**5.0 Indoor Environmental Quality (IEQ)**

5.R1 Minimum IAQ Performance
5.R2 Environmental Tobacco Smoke (ETS) Control
5.C1 IAQ Monitoring
5.C2 Increase Ventilation Effectiveness
5.C3 Construction IAQ Management Plan
5.C4 Low-Emitting Materials
5.C5 Indoor Chemical and Pollutant Source Control
5.C6 Controllability of Systems
5.C7 Thermal Comfort
5.C8 Daylight and Views
5.C9 Acoustic Environment /Noise Control
5.C10 Facility In-Use IAQ Management Plan

**6.0 Facility Delivery Process**

6.C1 Holistic Delivery of Facility

**7.0 Current Mission**

7.C1 Operation and Maintenance
7.C2 Soldier and Workforce Productivity and Retention

**8.0 Future Missions**

8.C1 Functional Life of Facility and Supporting Systems
8.C2 Adaptation, Renewal and Future Uses

## NOTES

This Sustainable Project Rating Tool (SPiRiT) is derived from The U. S. Green Building Council LEED 2.0 (Leadership in Energy and Environmental Design) Green Building Rating System™.

The SPiRiT numbering scheme parallels, but does not match LEED 2.0. LEED does not number major sections, which it calls 'Credit Categories,' ex. 'Sustainable Sites,' rather it numbers criteria or 'credits' within each major section. SPiRiT credit numbers match those of LEED where there is a 1:1 comparison. Where additional credits have been added they fall at the end of major sections.

The Recommended SPiRiT Documentation of Credits follow the format: Intent and Recommended Documentation.

Intent: A statement of the primary goal for the credit;
Recommended Documentation: Recommended sections of the specifications, drawings, and/or design analysis where information required substantiating the credit should be located.

Projects are evaluated for each SPiRiT credit which are either 'Prerequisites' or result in a point score:

Prerequisites: These credits are a statement of minimum requirements and must be met. A project will not be considered to have achieved certification unless all prerequisites are met.

Point Score: These credits are evaluated and result in a point score. Where the potential score is greater than 1, no partial points are granted.

SPiRiT Sustainable Project Certification Levels:

| | |
|---|---|
| SPiRiT Bronze | 25 to 34 Points |
| SPiRiT Silver | 35 to 49 Points |
| SPiRiT Gold | 50 to 74 Points |
| SPiRiT Platinum | 75 to 100 Points |

SPiRiT credits have been developed to address facility life cycle phases including programming, design, construction, and commissioning.

POC for U. S. Army Corps of Engineers:
Mr. Harry Goradia
U. S. Army Corps of Engineers
ATTN: CEMP-ET
441 G Street NW
Washington, DC 20314
Phone (202) 761-7170, FAX (202) 761-0633
Email harry.goradia@hq02.usace.army.mil

POC for U. S. Army Installations:
Mr. John Scharl
U. S. Army Assistant Chief of Staff for Installation Management
Directorate of Facilities & Housing
ATTN: DAIM-FDF
7701 Telegraph Road, Bldg #2594 (Room 146B), Alexandria, VA 22315-3800
Phone (703) 428-7614, FAX (703) 428-0197
Email scharja@hqda.army.mil

# 1.0 Sustainable Sites Recommended Documentation

**1.R1** **Erosion, Sedimentation, and Water Quality Control** [1]

**Intent:** Control erosion and pollutants to reduce negative impacts on water and air quality.

**Suggested Documentation**

Specifications: Include the language and specifically the objectives from 1.R1 in the general conditions of the specifications under the following the CSI Master Format Section: 01570 Temporary Controls, and 02370 Erosion and Sedimentation Control.

Drawings: Highlight erosion and sedimentation controls on the appropriate site plan sheet such as the Site Grading Plan, Site Demolition Plan, or Site Development Plan.

Design Analysis: **OR** Prepare an Erosion and Sedimentation Control Plan to be included in the Design Analysis. Reference this plan in the general conditions sections of the specifications listed above.

**1.C1** **Site Selection** [1]

**Intent:** Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site. Select site based on functional adjacencies/relationships and land use compatibility.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Include a narrative describing the site selection process. Specifically mention endangered species, prime training lands or agricultural land, flood plain situation, and wetland situations for the site. When available, include FEMA maps, or USGS soil surveys maps.

Design Analysis: Include a narrative describing the functional adjacencies and the land use compatibility of the selected site. Specifically mention the sites integration with surrounding uses and connectivity to transit systems.

**1.C2** **Installation/Base Redevelopment** [1]

**Intent:** Channel development to installation/base cantonment areas with existing infrastructure, protecting greenfields and preserving habitat and natural resources.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Describe the density goals for the project and discuss any density requirements from the base Master Plan. Calculate the radius to include in the local density by multiplying 3 times the square root of the site square footage (See LEED Reference Guide for more details). Include a table showing all buildings that fall within this radius (in whole or in part) and give the building square footage, and site area. Sum all the square footages and divide the total building area by total site area. Discuss how the local density fits with the project density goals.
Include a narrative describing of existing infrastructure at the site such as roads, utilities, etc., and how the proposed project will take advantage of these existing features.

[1] Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 1.0 Sustainable Sites Recommended Documentation (Continued)

**1.C3** **Brownfield Redevelopment (1)**

**Intent:** Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.

**Suggested Documentation**

Specifications: Include specific requirements for site remediation in the following CSI Master Format Section: 02200 Site Hazardous Materials Removal, and 02300 Site Decontamination.

Drawings: NA

Design Analysis: For contaminated sites, include a Site Remediation Plan in accordance with the EPA's Brownfield Redevelopment program requirements. For previously remediated sites, include documentation from the site remediation that was performed showing compliance with the EPA standard mentioned.

**1.C4** **Alternative Transportation (1)**

**Intent:** Reduce pollution and land development impacts from automobile use.

**Suggested Documentation**

Specifications: Specify bike parking under one of the following CSI Master Format Sections: 05500 Metal Fabrications, and 11000 Equipment.

Drawings: Highlight bike parking on the Landscaping Plan, Site Development Plan, or equivalent plan. Include details for bike storage installation in the Site Details sheets. Also highlight the location of showers on the architectural plans.

Show the number of parking spaces provided on the appropriate site plan drawing such as the Site Paving Plan, or Site Development Plan. Highlight preferred parking for carpools or vanpools.

Provide an area drawing or site map highlighting the refueling station location and showing the project location and indicate the distance between them. Include a scale bar for distance measurement.

Design Analysis: Describe the proximity to installation mass transit system in a design narrative. Specify the distance to bus stops or commuter rail, light rail, or subway stops.

Provide calculations showing that bike storage and shower facilities are provided for at least 5% of the building occupants.

Provide calculations for the number of parking spaces in the design analysis.

Include a narrative describing local zoning parking requirements and provide calculations demonstrating compliance with the minimum allowable requirements

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 1.0 Sustainable Sites Recommended Documentation (Continued)

**1.C5** **Reduced Site Disturbance** (1)

**Intent**: Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

**Suggested Documentation**

Specifications: 01560 Temporary barriers and enclosures, 02230 Site Clearing, and 02300 Earthwork.

Drawings: Show the boundary for site disturbance on the Site Grading Plan, Site Demolition/Development Plans, or equivalent plans demonstrating that all site disturbance is within the required dimensions.

**OR** For the restoration option discussed in this credit, show the planting areas as well as a planting schedule on the Landscape Plan. Distinguish between existing landscaping and restored landscaping.

Design Analysis: Include a copy of the open space requirements from the Installation Master Plan or local zoning code. Provide calculations demonstrating that the requirement has been satisfied.

**1.C6** **Stormwater Management** (1)

**Intent**: Limit disruption of natural water flows by minimizing storm water runoff, increasing on-site infiltration, and reducing contaminants.

**Suggested Documentation**

Specifications: 02600 Drainage and Containment, and 02700 Pavements.

02300 Earthwork, and 11300 Fluid Waste Treatment and Disposal Equipment.

Drawings: On the appropriate site plan, such as the Site Paving Plan or Landscape Plan, highlight paved area and site contours showing how water is retained on site. Provide a paving schedule indicating the type of paving used in each area and a reference to the perviousness of the material. Also highlight locations of retaining ponds or other systems intended to minimize stormwater runoff.

Show the location of passive systems on the appropriate site plan such as on the Site Grading Plan, Site Development Plan, or Landscape Plan. Include detail drawings for active systems such as mechanical filters

Design Analysis: Provide cut sheets for pervious paving systems used to lower runoff.

**OR** Provide a stormwater management plan as described in the credit for sites with existing imperviousness.

Provide calculations showing that run off has been reduced by 50% from undeveloped to developed conditions. Provide a design narrative and calculations describing how the designed treatment systems will meet the requirements of this credit.

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 1.0 Sustainable Sites Recommended Documentation (Continued)

### 1.C7 Landscape and Exterior Design to Reduce Heat Islands (2)

**Intent:** Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

**Suggested Documentation**

Specifications: 02700 Pavements, and 02900 Planting.

07300 Steep Roofing, 07400 Roofing and Siding Panels, and 07500 Membrane Roofing.

Drawings: On the Landscaping plans, show location, type of vegetation used for shading, and information about the mature size of selected vegetation. Highlight the impervious area to be shaded, or otherwise demonstrate with calculations and diagrams that 30% will be shaded with in 5 years.

**OR** Indicate on the Site Paving Plan the area where light-colored/high-albedo materials will be used and demonstrate that it accounts for at least 30% of the impervious areas.

**OR** Demonstrate that at least 50% of the total parking is under-ground by indicating the number of spaces located in the underground parking as well as the number of parking spaces above ground. When underground parking is provided, the first few sheets of the architectural plans are typically reserved for below-grade floors and parking information used to satisfy this credit should be shown on these sheets.

**OR** Indicate on the Site Paving Plan the area where pervious paving systems will be used and demonstrate that it accounts for at least 50% of the parking lot areas. Also include a note on the Paving Plan drawings stating that the pervious paving system is to have an impervious area of LESS than 50%.

On the Roof Plan, show that a minimum of 75% of the roof area meets the requirements for reflectance and emissivity. Specify roofing type, reflectance, and emissivity on the Roof Plan as well as any area calculations.

For Green roofs, show on the Roof Plan that the green roof covers at least 50% of the total roof area. Also reference detail drawings for the green roof. (Detail drawings are typically included toward the end of the Architectural pages of the Construction Documents.)

Design Analysis: NA

### 1.C8 Light Pollution Reduction (1)

**Intent:** Eliminate light trespass from the building site, improve night sky access, and reduce development impact on nocturnal environments.

**Suggested Documentation**

Specifications: 16500 Lighting.

Drawings: On electrical plans, highlight exterior lighting as needed to demonstrate compliance.

Design Analysis: Include cutsheets and lighting calculations in the Design Analysis that demonstrate compliance.

---

(2) © U. S. Green Building Council. Used by permission.

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 1.0 Sustainable Sites Recommended Documentation (Continued)

### 1.C9 Optimize Site Features

**Intent:** Optimize utilization of the site's existing natural features and placement of man-made features on the site.

**Suggested Documentation**

Specifications: 02230 Site Clearing, 02300 Earthwork, and 13600 Solar and Wind Energy Equipment.

Drawings: NA

Design Analysis: Include a narrative describing the prevailing winds and solar properties of the site that were taken into consideration in the design. Also describe systems incorporated into the building to take advantage of free site energy to meet the requirements.

**AND** In the Design Analysis describe efforts taken to minimize cut and fill on the site in accordance with this credit. On the Site Grading Plan show existing and proposed contours.

### 1.C10 Facility Impact

**Intent:** Minimize negative impacts on the site and on neighboring properties and structures; avoid or mitigate excessive noise, shading on green spaces, additional traffic, obscuring significant views, etc.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Include a narrative describing the measures taken to minimize impact on the site through employing the appropriate densities and taking advantage of adjacencies. Explain how the proposed design meets intent of the Base Master Plan.

Include diagrams for solar access and the resulting shadows for winter and summer seasons. Indicate the prevailing winds on a site plan diagram.

Include a narrative of measures taken to reduce excess noise, minimize blocking of significant views, and transportation planning measures. Refer to specific drawings when appropriate.

### 1.C11 Site Ecology

**Intent:** Identify and mitigate all existing site problems including contamination of soil, water, and air, as well as any negative impacts caused by noise, eyesores, or lack of vegetation, enhancing or creating new site habitat.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Include a Site Ecology Plan for environmental management and mitigation of negative impacts.

## 2.0 Water Efficiency Recommended Documentation

### 2.C1 Water Efficient Landscaping (2)

**Intent:** Limit or eliminate the use of potable water for landscape irrigation.

**Suggested Documentation**

Specifications: 02810 Irrigation systems, 02900 Plantings, and 02600 Drainage and Containment.

02810 Irrigation systems, 02900 Plantings, and 02600 Drainage and Containment.

Drawings: Show and highlight the location of rainwater collection cistern on the Site plan.

Note on Landscape plans “NO PERMANENT LANDSCAPE IRRIGATION SYSTEM TO BE INSTALLED”

Design Analysis: Include a narrative describing the irrigation system and the features that make it efficient. Provide baseline calculations and design calculations for the insulation system. Also include an explanation of native or adapted planting.

**OR** Provide a narrative describing the gray water irrigation system. Provide baseline calculations and design calculations for the insulation system. Also include an explanation of native or adapted planting.

Include a narrative describing the gray water irrigation system. Provide baseline calculations and design calculations showing that the system is capable of providing 100% of the irrigation required for the site.

**OR** Provide a narrative describing how the site will not require permanent irrigation.

### 2.C2 Innovative Wastewater Technologies (2)

**Intent:** Reduce generation of wastewater and potable water demand, while increasing local aquifer recharge.

**Suggested Documentation**

Specifications: 15400 Plumbing Fixtures and Equipment, 11300 Wastewater Biological Sys. Equipment, 13220 Wastewater Filtration Equipment, and 13260 Wastewater Handling and Treatment Equipment.

Drawings: Highlight fixtures and schedules on the Plumbing Plans for systems used to reduce potable water use.

**OR** Show organic or natural treatment systems on the Site Plan or on the Landscape Plan. Show location of mechanical treatments systems on the Floor Plan and submit shop drawings. Highlight high-efficiency plumbing fixtures on the Mechanical or Plumbing sheets.

Design Analysis: Describe measures taken to reduce potable water consumption. Provide design calculations and baseline calculations for municipally provided potable water.

**OR** Provide design calculations for the on-site wastewater system. Describe how the system works and demonstrate that it is capable of treating all wastewater to the required levels.

(2) © U. S. Green Building Council. Used by permission.

## 2.0 Water Efficiency Recommended Documentation (Continued)

**2.C3** **Water Use Reduction** (1)

**Intent:** Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

**Suggested Documentation**

Specifications: 15400 Plumbing Fixtures and Equipment, 15700 HVAC Equipment, and Division 11—Equipment.

Drawings: NA

Design Analysis: Describe the strategies used to reduce the water consumption by 20% from the baseline calculations. Provide design calculations and baseline calculations demonstrating compliance.

Provide design calculations and baseline calculations demonstrating a total 30% reduction of water use from the baseline calculations.

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 3.0 Energy and Atmosphere Recommended Documentation

**3.R1** **Fundamental Building Systems Commissioning** (1)

**Intent:** Verify and ensure that fundamental building elements and systems are designed, installed, and calibrated to operate as intended.

**Suggested Documentation**

Specifications: 01800 Facility Operation, and 15950 Testing/Adjusting/Balancing.

Drawings: NA

Design Analysis: Provide a copy of the contract with the commissioning agent and a copy of the commissioning plan. Include a narrative that describes how the other aspects of this requirement have been satisfied.

**3.R2** **Minimum Energy Performance** (1)

**Intent**: Establish the minimum level of energy efficiency for the base building and systems.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Provide a narrative or summary table of design features that comply with TI-800-01 which references UFC 3-400-01, Design: Energy Conservation.

Provide a copy of the report from energy simulation software (BLAST, DOE-2, and EnergyPlus) as per requirements of ASHRAE 90.1-2001 demonstrating compliance as outlined.

**3.R3** **CFC Reduction in HVAC&R Equipment** (2)

**Intent:** Reduce ozone depletion.

**Suggested Documentation**

Specifications: 15600 Refrigeration Equipment, 15700 HVAC Equipment, and 01800 Facility Operation.

Drawings: NA

Design Analysis: Provide or include a review of the CFC phase-out/conversion in the commissioning plan demonstrating compliance as outlined.

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

(2) © U. S. Green Building Council. Used by permission.

## 3.0 Energy and Atmosphere Recommended Documentation (Continued)

### 3.C1 Optimize Energy Performance (1)

**Intent**: Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associated with excessive energy use.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Provide a narrative describe the energy saving measures incorporated in the building. Show a table of model variables that differ from the baseline case to the proposed design and give the values used in the energy simulation.

Provide a copy of the report from energy simulation software (BLAST, DOE-2, and EnergyPlus) showing the percentage that the Energy Cost Budget (the performance baseline) is less than the Design Energy Cost as defined in draft Appendix G to ASHRAE 90.1-2001. Life Cycle Costing is to be done in accordance with 10 CFR 436.

### 3.C2 Renewable Energy (1)

**Intent:** Encourage and recognize increasing levels of self-supply through renewable technologies to reduce environmental impacts associated with fossil fuel energy use.

**Suggested Documentation**

Specifications: 01800 Facility Operation, 13600 Solar and Wind Energy Equipment, and 16200 Electrical Power.

Drawings: Highlight the location of renewable energy systems on the Site Plan and on the architectural plans where appropriate.

Design Analysis: Provide calculations showing the percentage of building energy provided by on-site renewable energy systems. Include a narrative describing energy saving measures incorporated in the building. Include a section in the Commissioning Plan to ensure that the percentage of power provided by renewable systems is maintained throughout the facility life cycle.

### 3.C3 Additional Commissioning (2)

**Intent:** Verify and ensure that the entire building is designed, constructed, and calibrated to operate as intended.

**Suggested Documentation**

Specifications: 01800 Facility Operation, and 15950 Testing/Adjusting/Balancing.

Drawings: NA

Design Analysis: Include a copy of the contract for additional commissioning and the commissioning plan in the Design Analysis.

---

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

(2) © U. S. Green Building Council. Used by permission.

## 3.0 Energy and Atmosphere Recommended Documentation (Continued)

**3.C4** **<< Deleted >> (1)**

**3.C5** **Measurement and Verification (1)**

**Intent**: Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.

**Suggested Documentation**

Specifications: 16290 Power Measure & Control, and 15900 HVAC Instrumentation and Control.

Drawings: Highlight the equipments installed in the building for purposes of monitoring on the Mechanical Plan, and Electrical Plan.

Design Analysis: Include a list of all measurement devices installed in the building. Also provide a copy of the measurement and verification plan with a summary schedule of instruments and controls related to each monitoring category.

**3.C6** **Green Power (1)**

**Intent:** Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Provide calculations for the expected building power consumption, based on the building energy modeling results. Include a copy of a minimum 2-year contract to purchase power equal to the projected building consumption.

**3.C7** **Distributed Generation**

**Intent:** Encourage the development and use of distributed generation technologies, which are less polluting than grid-source energy.

**Suggested Documentation**

Specifications: 01800 Facility Operation, 13600 Solar and Wind Energy Equipment, and 16200 Electrical Power.

Drawings: Highlight the location of generation equipment/facilities on the Site Plan.

Design Analysis: Provide narrative including calculations demonstrating that the on-site energy generation system is capable of supplying 50% of the building energy requirements. Include a section in the Commissioning Plan to ensure that the percentage of power provided by renewable systems is maintained throughout the facility life cycle.

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

# 4.0 Materials and Resources Recommended Documentation

**4.R1** **Storage & Collection of Recyclables** (1)

**Intent:** Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

**Suggested Documentation**

Specifications: 11170 Solid Waste Handling Equipment.

Drawings: Highlight the area for collection of recyclables on the floor plans. Also highlight locations of waste collection chutes and receptacle areas.

Design Analysis: Provide a narrative substantiating that the space allotted for collection of recyclables is adequate for the facility.

**4.C1** **Building Reuse** (1)

**Intent:** Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

**Suggested Documentation**

Specifications: 02225 Selective Demolition.

Drawings: Note and highlight on the architectural demolition drawings the structural elements which are to be preserved. On the Elevations, note and highlight the shell elements to be preserved.

Provide calculations substantiating that 100% of the existing building structure and shell are being preserved **AND** 50% of the non-shell components.

Design Analysis: Provide calculations substantiating that at least 75% of the existing building structure and shell are being preserved.

**4.C2** **Construction Waste Management** (1)

**Intent:** Divert construction, demolition, and land clearing debris from landfill disposal. Redirect recyclable material back to the manufacturing process.

**Suggested Documentation**

Specifications: 01505 Construction Waste Management.

Drawings: Indicate on appropriate architectural, plumbing, mechanical, and electrical demolition drawings which materials are expected to be diverted.

Design Analysis: Include a Construction Waste Management Plan.

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 4.0 Materials and Resources Recommended Documentation (Continued)

**4.C3** **Resource Reuse** (2)

**Intent:** Extend the life cycle of targeted building materials, reducing environmental impacts related to materials manufacturing and transport.

**Suggested Documentation**

Specifications: XX050 for each material division.

Drawings: Indicate with notes on appropriate architectural drawing where refurbished materials are to be used.

Design Analysis: Provide a table listing all sections of the specifications where salvaged or refurbished material have been specified including the respective estimated dollar values of these materials. Demonstrate that this accounts for 5% or 10% of the building materials used.

**4.C4** **Recycled Content** (1)

**Intent:** Increase demand for building products that have incorporated recycled content material, reducing the impacts resulting from extraction of new material.

**Suggested Documentation**

Specifications: XX050 for each material division.

Drawings: NA

Design Analysis: Provide a table listing all sections of the specifications where recycled materials or materials with recycled content are available. List the percentage of recycled content per material, the estimated quantity, the cost, and the total estimated project cost. Provide calculations showing that the requirement(s) has been satisfied.

**4.C5** **Local/Regional Materials** (2)

**Intent**: Increase demand for building products that are manufactured locally, reducing the environmental impacts resulting from transportation, and supporting the local economy.

**Suggested Documentation**

Specifications: XX050 for each material division.

Drawings: NA

Design Analysis: Provide a table listing all sections of the specifications for which material is available within a 500 mile radius. List the estimated quantity, unit cost, and the total estimated project cost. Demonstrate that 20% of the building materials were obtained within a 500 mile radius.

List the estimated quantity, unit cost, and the total estimated project cost. Demonstrate that 50% of the building materials above were harvested, extracted, or recovered within a 500 mile radius

(2) © U. S. Green Building Council. Used by permission.

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 4.0 Materials and Resources Recommended Documentation (Continued)

**4.C6** **Rapidly Renewable Materials** (2)

**Intent:** Reduce the use and depletion of finite raw and long cycle renewable materials by replacing them with rapidly renewable materials.

**Suggested Documentation**

Specifications: XX050 for each division, and 09600 Flooring.

Drawings: Note on appropriate architectural finish drawings where rapidly renewable materials are required.

Design Analysis: Provide a table listing sections of the specifications that call for rapidly renewable materials. Show calculations that demonstrate that rapidly renewable materials account for 5% of total building materials.

**4.C7** **Certified Wood** (2)

**Intent:** Encourage environmentally responsible forest management.

**Suggested Documentation**

Specifications: 06100 Rough Carpentry, 06200 Finish Carpentry, and 06400 Architectural Woodwork.

Drawings: Note on applicable architectural and structural drawings where certified wood is to be used.

Design Analysis: Provide a list of all wood-based products used. Highlight the areas where certified wood-based materials were used and demonstrate that certified wood accounts for 50% of all wood used for the project. Supply copies of wood certification documentation from the manufacturer.

(2) © U. S. Green Building Council. Used by permission.

# 5.0 IEQ Recommended Documentation

**5.R1** **Minimum IAQ Performance** (1)

**Intent:** Establish minimum IAQ performance to prevent the development of indoor air quality problems in buildings, maintaining the health and well being of the occupants.

**Requirement:** Meet the minimum requirements of voluntary consensus standard ASHRAE 62-1999, Ventilation for Acceptable Indoor Air Quality and approved Addenda.

**Suggested Documentation**

Specifications: 01800 Facility Operation, and 15950 Testing/Adjusting/Balancing.

Drawings: Include a note on the first sheet of the mechanical drawings indicating desired compliance with ASHRAE 62-1999.

Design Analysis: Include a section in the design analysis describing the ventilation systems and how the project complies with ASHRAE 62-1999. Also state design criteria and assumptions.

**5.R2** **Environmental Tobacco Smoke (ETS) Control** (2)

**Intent:** Prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS).

**Suggested Documentation**

Specifications: 01800 Facility Operation, and 15950 Testing/Adjusting/Balancing.

Drawings: Indicate designated outdoor smoking areas on the Site Plan (if applicable).

Design Analysis: NA

**5.C1** **IAQ Monitoring** (1)

**Intent:** Provide capacity for indoor air quality (IAQ) monitoring to sustain long-term occupant health and comfort.

**Suggested Documentation**

Specifications: 01800 Facility Operation, 13850 Detection and Alarm, and 15950 Testing/Adjusting/Balancing. Specifically note that indoor CO2 levels should never be permitted to exceed outdoor levels by more than 530 parts per million.

Drawings: Highlight the location of $CO_2$ monitoring equipment in the Mechanical Drawings. Also state the set-point parameters.

Design Analysis: NA

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

(2) © U. S. Green Building Council. Used by permission.

## 5.0 IEQ Recommended Documentation (Continued)

**5.C2** **Increase Ventilation Effectiveness** (2)

**Intent:** Provide for the effective delivery and mixing of fresh air to building occupants to support their health, safety, and comfort.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Provide plan and elevation drawings including furniture for each major room type. Graphically show how the air-flow patterns are designed to meet the requirements of this credit. Also include a specification table of all the terminal vents, grills, and registers cross-referenced in the drawings.

**5.C3** **Construction IAQ Management Plan** (2)

**Intent:** Prevent indoor air quality problems resulting from the construction/renovation process, to sustain long term installer and occupant health and comfort.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Provide a copy of the Construction IAQ Management Plan to be implemented during construction and pre-occupancy. Highlight areas that demonstrate how the SMACNA guidelines have been met or exceeded.

Provide a letter from the architect or engineer detailing the building flush-out process, or provide a letter specifying an indoor air quality test to be performed in accordance with this credit following construction.

**5.C4** **Low-Emitting Materials** (2)

**Intent:** Reduce the quantity of indoor air contaminants that are odorous or potentially irritating to provide installer and occupant health and comfort.

**Suggested Documentation**

Specifications: 05950 Paints & Protective Coatings, 06100 Rough Carpentry, 06600 Plastic Fabrications, 07900 Joint Sealers, 09600 Flooring, 09700 Wall Finishes, and 09900 Paints & Coatings.

Drawings: NA

Design Analysis: NA

(2) © U. S. Green Building Council. Used by permission.

## 5.0 IEQ Recommended Documentation (Continued)

**5.C5** **Indoor Chemical and Pollutant Source Control** (1)

**Intent:** Avoid exposure of building occupants to potentially hazardous chemicals that adversely impact air quality.

**Suggested Documentation**

Specifications: 08400 Entrances, 12400 Furnishings and Accessories, and 15100 Building Services Piping.

Drawings: Note permanent entryway systems such as grills, grates, etc. at all exterior entrances on the First Floor Plan or other plan sheets with building entrances from outdoors. Cross-reference and highlight positive pressure systems for entryways with the Mechanical Plans. Also highlight the exhaust air systems used in chemical use areas (housekeeping and copy/print rooms). Highlight drainage systems for rooms where chemical and water mixing may occur in the Plumbing Plans and Plumbing Schematics.

Design Analysis: NA

**5.C6** **Controllability of Systems** (2)

**Intent:** Provide a high level of individual occupant control of thermal, ventilation, and lighting systems to support optimum health, productivity, and comfort conditions.

**Suggested Documentation**

Specifications: 08500 Windows, and 15900 HVAC Instrumentation and Controls.

Drawings: Provide a window schedule highlighting the operable windows for rooms with floor area within 15 feet of the perimeter. Highlight the location lighting controls on the Electrical Plan.

Indicate lighting controls on the Electrical Plan. Highlight temperature and airflow controls on the Mechanical Plan, or Air Distribution Plan. Indicate the expected occupancy of each non-perimeter room on the Floor Plan.

Design Analysis: Provide a floor plan diagram showing a line indicating 15 feet from building perimeter. Demonstrate with calculations that each room within 15 feet of the perimeter has at least one operable window and one lighting control zone for every 200 square feet of floor area that is regularly occupied.

Provide a floor plan diagram showing a line indicating 15 feet from building perimeter. Demonstrate with a table or other calculations that lighting and airflow controls have been provided for each occupant for all regularly occupied rooms not within 15 feet of the building perimeter.

(1) Adapted material not reviewed or endorsed by U. S. Green Building Council.

(2) © U. S. Green Building Council. Used by permission.

## 5.0 IEQ Recommended Documentation (Continued)

**5.C7** **Thermal Comfort (2)**

**Intent:** Provide for a thermally comfortable environment that supports the productive and healthy performance of the building occupants.

**Suggested Documentation**

Specifications: 13400 Measurement and Control Instrumentation, 13500 Recording Instrumentation, and 13800 Building Automation and Control

Drawings: Highlight the location of temperature and humidity monitoring systems on the Mechanical Plan or Air Distribution Plan.

Design Analysis: Provide a letter from the mechanical engineer stating that the system design is done in accordance with ASHRAE standard 55-1992 Addenda 1995. For naturally ventilated systems, provide a letter from the mechanical engineer stating that the project complies with the 90% acceptability limits of the adaptive comfort temperature boundaries in the California High Performance Schools (CHPS) Best Practices Manual Appendix C – A Field Based Thermal Comfort Standard for Naturally Ventilated Buildings, Figure 2.

Provide a narrative from the mechanical engineer describing the location of, and monitoring instrumentation installed. Reference appropriate plan sheets where the equipment discussed is shown.

**5.C8** **Daylight and Views (2)**

**Intent:** Provide a connection between indoor spaces and the outdoor environment through the introduction of sunlight and views into the occupied areas of the building.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Provide calculations based on the Daylight Factor equation from the LEED2.0 Reference Guide showing that 75% of all spaces occupied for critical visual tasks have at least a 2% daylight factor.

Provide calculations with a supporting floor plan diagrams indicating the lines of sight and access to views for 90% of occupied spaces.

(2) © U. S. Green Building Council. Used by permission.

## 5.0 IEQ Recommended Documentation (Continued)

**5.C9** **Acoustic Environment /Noise Control**

**Intent**: Provide appropriate acoustic conditions for user privacy and comfort.

**Suggested Documentation**

Specifications: 13080 Sound, and Vibration and Seismic Control.

Drawings: NA

Design Analysis: Provide a narrative detailing the existing environmental noise issues and describe the measures employed to mitigate the environmental noise issues.

**5.C10** **Facility In-Use IAQ Management Plan**

**Intent:** Ensure the effective management of facility air quality during its life.

**Suggested Documentation**

Specifications: 15900 HVAC Instrumentation and Controls.

Drawings: NA

Design Analysis: Provide a draft version of the Air Quality Action Plan outlining occupant/manager training and also a systems maintenance schedule.

# 6.0 Facility Delivery Process Recommended Documentation

**6.C1** **Holistic Delivery of Facility**

**Intent**: Encourage a facility delivery process that actively engages all stakeholders in the design process to deliver a facility that meets all functional requirements while effectively optimizing tradeoffs among sustainability, first costs, life cycle costs, and mission requirements.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Include a section entitled Facility Delivery Report that documents the design process showing how the credit requirements were met. As a minimum, include the following information showing attainment for each requirement.

Provide a list of perspective team members with brief descriptions of their previous experience. Include team members who may have been consultants during the design process.

Provide a schedule of training dates to take place during the construction process. Show that the entire team was trained and that all members of the delivery team were aware of the project goals and objectives.

Provide a list and explanation of the sustainability goals used during the project design.

Submit a list of charrettes conducted and a description of each including dates, agenda, and results. A minimum set of charrettes includes planning charrette, ecological design charrette, and scoring charrettes.

Provide a list of suggested portions of the project that may benefit from a more in-depth analysis of first cost, life-cycle cost as compared to mission requirements and project goals. Submit a tentative schedule of team meetings to discuss each of the suggested portions of the project.

Submit a list of measurable facility operations that can be used to document the performance of the building through its entire life-cycle.

# 7.0 Current Mission Recommended Documentation

**7.C1** **Operation and Maintenance**

**Intent:** Encourage the development of a facility delivery process that enhances efficient operation and maintenance of the facility.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Develop a Facility Operations and Maintenance Manual including sections on facility commissioning requirements, O&M instruction including preventative maintenance, training programs for occupants and personnel, green housekeeping, and recycling/waste management. Specifically address each of the points as outlined.

**7.C2** **Soldier and Workforce Productivity and Retention**

**Intent:** Provide a high-quality, functional, healthy, and safe work environment to promote soldier and workforce productivity and retention.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Prepare a narrative of design considerations and steps taken in the design process to enhance the quality and functionality of the indoor environment, and contribute to the health, safety, and productivity of the building occupants. Specifically address each of the points as outlined. These design considerations will later be incorporated into the Soldier and Workforce Productivity Report that will document how these goals have been met.

# 8.0 Future Missions Recommended Documentation

**8.C1** **Functional Life of Facility and Supporting Systems**

**Intent:** Assess the functional life of a facility and its supporting systems to optimize the infrastructure investment.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Submit a letter from the architect or responsible design professional describing the durability and projected life-span of the building structure and envelope, HVAC and plumbing systems, communications and electronic systems, electrical and power systems, and any other germane systems. Include descriptions of any measures taken during the design process to maximize the useful-life of the building.

**8.C2** **Adaptation, Renewal and Future Uses**

**Intent**: Encourage facility design that is responsive to change over time to maximize accommodation of future uses without creating waste and ensuring maximum useful life of products.

**Suggested Documentation**

Specifications: NA

Drawings: NA

Design Analysis: Submit a letter from the architect or responsible design professional describing possible design features that add flexibility to the building in terms of possible future adaptive uses for the facility. Include a description of design features that accommodate efficient adaptation and reconfiguration of these systems. Describe the technologies and strategies employed in the design including but not limited to those described in this credit. Also include a letter from the architect stating that the design uses the minimal amount of space necessary to adequately meet the current mission and functional requirements while incorporating expansion and adaptation capabilities for future missions.

## Completed Documentation Checklist

| | | |
|---|---|---|
| **1.0** | **Sustainable Sites (S)** | |
| 1.R1 | Erosion, Sedimentation and Water Quality Control | |
| 1.C1 | Site Selection | |
| 1.C2 | Installation/Base Redevelopment | |
| 1.C3 | Brownfield Redevelopment | |
| 1.C4 | Alternative Transportation | |
| 1.C5 | Reduced Site Disturbance | |
| 1.C6 | Stormwater Management | |
| 1.C7 | Landscape and Exterior Design to Reduce Heat Islands | |
| 1.C8 | Light Pollution Reduction | |
| 1.C9 | Optimize Site Features | |
| 1.C10 | Facility Impact | |
| 1.C11 | Site Ecology | |
| **2.0** | **Water Efficiency (W)** | |
| 2.C1 | Water Efficient Landscaping | |
| 2.C2 | Innovative Wastewater Technologies | |
| 2.C3 | Water Use Reduction | |
| **3.0** | **Energy and Atmosphere (E)** | |
| 3.R1 | Fundamental Building Systems Commissioning | |
| 3.R2 | Minimum Energy Performance | |
| 3.R3 | CFC Reduction in HVAC&R Equipment | |
| 3.C1 | Optimize Energy Performance | |
| 3.C2 | Renewable Energy | |
| 3.C3 | Additional Commissioning | |
| 3.C4 | <<Deleted>> | |
| 3.C5 | Measurement and Verification | |
| 3.C6 | Green Power | |
| 3.C7 | Distributed Generation | |
| **4.0** | **Materials and Resources (M)** | |
| 4.R1 | Storage & Collection of Recyclables | |
| 4.C1 | Building Reuse | |
| 4.C2 | Construction Waste Management | |
| 4.C3 | Resource Reuse | |
| 4.C4 | Recycled Content | |
| 4.C5 | Local/Regional Materials | |
| 4.C6 | Rapidly Renewable Materials | |
| 4.C7 | Certified Wood | |
| **5.0** | **Indoor Environmental Quality (IEQ) [Q]** | |
| 5.R1 | Minimum IAQ Performance | |
| 5.R2 | Environmental Tobacco Smoke (ETS) Control | |
| 5.C1 | IAQ Monitoring | |
| 5.C2 | Increase Ventilation Effectiveness | |
| 5.C3 | Construction IAQ Management Plan | |
| 5.C4 | Low-Emitting Materials | |
| 5.C5 | Indoor Chemical and Pollutant Source Control | |
| 5.C6 | Controllability of Systems | |

| | Completed Documentation Checklist (Continued) | |
|---|---|---|
| 5.C7 | Thermal Comfort | |
| 5.C8 | Daylight and Views | |
| 5.C9 | Acoustic Environment /Noise Control | |
| 5.C10 | Facility In-Use IAQ Management Plan | |
| **6.0** | **Facility Delivery Process (P)** | |
| 6.C1 | Holistic Delivery of Facility | |
| **7.0** | **Current Mission** | |
| 7.C1 | Operation and Maintenance | |
| 7.C2 | Soldier and Workforce Productivity and Retention | |
| **8.0** | **Future Missions** | |
| 8.C1 | Functional Life of Facility and Supporting Systems | |
| 8.C2 | Adaptation, Renewal and Future Uses | |

## Project Points of Contact

# REPORT DOCUMENTATION PAGE

*Form Approved*
*OMB No. 0704-0188*



| 1. REPORT DATE (DD-MM-YYYY) | 2. REPORT TYPE | 3. DATES COVERED (From - To) |
|---|---|---|
| 09-2004 | Final | |

**4. TITLE AND SUBTITLE**
SPiRiT Scoring Through Self-Assessment Charrettes

**5a. CONTRACT NUMBER**

**5b. GRANT NUMBER**

**5c. PROGRAM ELEMENT NUMBER**

**6. AUTHOR(S)**
Richard Schneider and Donald F. Fournier

**5d. PROJECT NUMBER**
622784AT41

**5e. TASK NUMBER**
23

**5f. WORK UNIT NUMBER**
X211

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**
U.S. Army Engineer Research and Development Center (ERDC)
Construction Engineering Research Laboratory (CERL)
PO Box 9005
Champaign, IL 61826-9005

**8. PERFORMING ORGANIZATION REPORT NUMBER**
ERDC/CERL TR-04-19

**9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)**
Headquarters, U.S. Army Corps of Engineers
Directorate of Military Programs
441 G St., NW.
Washington, DC 20314-1000

**10. SPONSOR/MONITOR'S ACRONYM(S)**
CEMP-SPD

**11. SPONSOR/MONITOR'S REPORT NUMBER(S)**

**12. DISTRIBUTION / AVAILABILITY STATEMENT**
Approved for public release; distribution is unlimited.

**13. SUPPLEMENTARY NOTES**
Copies are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

**14. ABSTRACT**

The Sustainable Project Rating Tool (SPiRiT) was developed by the US Army Engineer Research and Development Center (ERDC) as a measurement system for rating new and major renovations to institutional buildings. SPiRiT evaluates environmental performance from a whole building perspective over a building's life cycle and provides a definitive standard to assess the sustain-ability or "green" attributes of the design-construct process for a given project. SPiRiT addresses critical areas of the design-construct process for seven categories or issues: site, water, energy usage, materials, indoor environmental quality, facility delivery, and current mission. The rating system consists of prerequisites and credits that when met provide points towards an overall score. The overall score is use to indicate one of four project certification levels—Bronze, Silver, Gold, and Platinum, indicating increasing levels of sustainability or "greenness." All Army Military Construction projects and major OMA projects must achieve a Bronze rating level. This guide provides an informational guide for installation Directorate of Public Works (DPW) and U.S. Army Corps of Engineer District Engineer staffs in conducting self-assessment charrettes to score projects designed to meet SPiRiT requirements.

**15. SUBJECT TERMS**

| | | |
|---|---|---|
| SPiRiT | sustainability | energy conservation |
| life cycle planning | LEED | sustainable design and development (SDD) |

| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| a. REPORT | b. ABSTRACT | c. THIS PAGE | | | Richard Schneider |
| Unclassified | Unclassified | Unclassified | SAR | 64 | 19b. TELEPHONE NUMBER (include area code) (217) 373-6752 |